

PATENT

PRELIMINARY AMENDMENT

EXPRESS MAIL CERTIFICATE

The undersigned further hereby certifies that this Preliminary Amendment and the referenced Separate Page Abstract, Rule 125 Statement and Substitute Specification "MARKED-UP" and "CLEAN" Versions are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on March 30, 2001 in an envelope bearing "Express Mail" Label No. EL257943824US and addressed to BOX PATENT APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231

 , Reg. No. 28,251.

David R. Plautz

Date of Signature: March 30, 2001.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Euan ARMSTRONG, *et al.*
Serial No. : 09/_____ (Rule 53(b)(1) continuation of 09/260,855)
Filed : Concurrently herewith
For : **CHOCOLATE CRUMB**
Group Art Unit : 1761 (Anticipated)
Examiner : Carolyn Paden (Anticipated)

**PRELIMINARY AMENDMENT TOGETHER WITH SUBMISSION OF
SUBSTITUTE SPECIFICATION INCLUDING RULE 125 STATEMENT**

Box Patent Application
Assistant Commissioner For Patents
Washington, D.C. 20231

Sir:

This amendment is accompanied by submission of a separate page abstract under separate cover and by a Substitute Specification under cover of a Rule 125 Statement.

Entry of the Substitute Specification, separate page abstract and claims presented below in advance of examination of this application on the merits respectfully is solicited.

It is not believed that this amendment occasions any fee, but should there be any fee, please charge the same to Deposit No. 22-0480.

The Substitute Specification is submitted with reference to 37 CFR 1.121 as presently constituted, and it is presented in accordance with 37 CFR 1.125, including submission of a Rule 125 Statement, and with MPEP §§608.01(q) and 714.20. The Substitute Specification is submitted in a form of a “MARKED-UP” Version, which identifies amendment insertions with underlining and amendment deletions with brackets, and in a form of a ‘CLEAN’ Version, which presents the specification disclosure, as amended, without underlining and brackets.

* * *

Please amend the application as follows:

IN THE TITLE

Please cancel the title and substitute therefor --**PREPARATION OF CRUMB PRODUCTS FOR CHOCOLATE PRODUCTION**-- .

IN THE ABSTRACT

Please cancel the abstract and substitute therefor the separate page abstract submitted concurrently herewith under separate cover.

IN THE SPECIFICATION

See the SUBSTITUTE SPECIFICATION (“MARKED-UP” and “CLEAN” Versions) submitted concurrently herewith.

IN THE CLAIMS

At page 10 of the application, first line, delete "CLAIMS" and insert therefor What is claimed is: .

As will be noted from page 1 of the transmittal letter which requested the filing of this application, cancellation of claim 19 was requested.

Additionally, now, please cancel claims 1 - 18 and add the following claims:

20. A process for preparation of a crumb product for preparing chocolate products which comprises:

adding together and mixing and heating ingredients which comprise milk solids and a sugar ingredient which comprises sucrose and so that the ingredients added together and mixed and heated have, by weight, a ratio of milk solids to sugar ingredient of between 1:0.1 and 1:3 and so that the ingredients being mixed and heated are heated-up to a temperature in a range of from 85°C to 180°C and then maintained at a temperature in the range of from 85°C to 180°C for a period of from 2.5 minutes to 25 minutes to obtain a heat-treated reaction product and wherein the ingredients added together and mixed and heated and the reaction product have a moisture content of between 1.2% and 8%; and then,

drying the reaction product without vacuum conditions at a temperature of from 60°C to 80°C to obtain a dried reaction product and so that the dried reaction product has a moisture content of less than 3% by weight.

21. A process according to claim 20 further comprising, prior to maintaining the ingredients being mixed at the temperature in the range of from 85°C to the heated-up temperature, mixing and heating the ingredients so that the ingredients are heated-up to a temperature in a range of from 85°C to 120°C.

22. A process according to claim 20 wherein the sugar ingredient comprises sucrose in an amount by weight based upon the sugar ingredient weight of at least 75%.

23. A process according to claim 20 wherein the ingredients added together and mixed and heated further comprise water added as an ingredient.

24. A process according to claim 20 wherein the ingredients added together and mixed and heated further comprise cocoa solids.

25. A process according to claim 20 wherein the cocoa solids are selected from the group consisting of cocoa liquor and cocoa powder.

26. A process according to claim 20 wherein the ingredients added together and mixed and heated further comprise a member selected from the group consisting of an equivalent of cocoa butter and of a substitute for cocoa butter.

27. A process according to claim 24 wherein, by weight based upon a total weight of the ingredients added together and mixed and heated, the cocoa solids are in an amount of from 3% to 20%.

28. A process according to claim 24 wherein, by weight, the cocoa solids are in an amount of from 5% to 15%.

29. A process according to claim 20 wherein the milk solids to sugar ingredient ratio is from 1:0.3 to 1:1.25.

30. A process according to claim 20 wherein the ingredients added together and mixed and heated and the reaction product prior to drying have a moisture content of from 1.5% to 7.5%.

31. A process according to claim 20 wherein the reaction product is dried to a moisture content of below 2% by weight.

32. A process according to claim 20 wherein the reaction product is dried at a temperature of from 60°C to 75°C.

33. A process according to claim 20 wherein the milk solids are selected from the group consisting of whole milk powder, low-fat milk solids and whey proteins.

34. A process according to claim 33 wherein the milk solids are low-fat milk solids and the low-fat milk solids are selected from the group consisting of skimmed milk powder, ingredients of skimmed milk powder and recombined milk solids.

35. A process according to claim 20 wherein the sugar ingredient has a powder form.

36. A process according to claim 20 wherein the sugar ingredient further comprises a substance selected from the group consisting of glucose, dextrose, lactose, fructose, invert sugar and corn syrup solids.

37. A process according to claim 22 wherein the sugar ingredient further comprises a sugar replacer selected from the group consisting of sorbitol, mannitol, xylitol, maltitol, lactitol or polydextrose.

REMARKS

As indicated in the introductory remarks above, entry of the Substitute Specification and Separate page abstract which accompany this amendment and of the claims presented above prior to action on the merits respectfully is solicited.

It is not believed that this amendment occasions any fees, but should there be any fee, please charge the same to Deposit Account No. 22-0480.

With a view to the Substitute Specification submission referred to in the introductory remarks above, in the following discussion, all citations are made with reference to the Substitute Specification "MARKED-UP" Version.

With a view to the recommendations of MPEP §608.01(a), a new title is presented above and also is set forth in the Substitute Specification, the new title being presented so that attention is directed to the fact that the present invention embraces preparation of crumb products for preparing chocolate products. For support, see the Substitute Specification, for example, at page 4, line 20, to page 5, line 7, at page 7, lines 23 - 28, and at page 8, lines 25 - 31.

It respectfully is submitted that it should be found that the title presented above and set forth in the Substitute Specification does not introduce new matter, and entry and approval of the same respectfully are solicited.

As in the parent application, with a view to the recommendations of MPEP §608.01(b), since the disclosure of the abstract as filed contained claim-type terminology, it is requested above that the as-filed abstract be cancelled, and a new abstract, which sets forth the character of the subjects matter covered by the technical disclosure and that which is new in the art to which those subjects matter pertain, is submitted concurrently herewith on a separate page under separate cover. In addition to support for the disclosure of the separate

page abstract present in the as-filed abstract, since the disclosure contains some terminology which is introduced into the specification disclosure, for ease of showing context of the same, see the discussion below of the amendments of the Substitute Specification, particularly those at page 4, line 20, to page 5, line 7, at page 6, lines 19 - 27, and at page 8, lines 18 - 23.

To place the application in the format conventionally employed in U.S. practice, it is requested above that headings, including an application "CROSS-REFERENCE" heading, be incorporated in the specification disclosure to identify the various portions of the specification, as recommended by MPEP §608.01(a), and it also is requested that the claims be introduced by the phrase "What is claimed is:", as recommended by MPEP §608.01(m).

To perfect benefit under 35 U.S.C. §120, amendment is presented in the Substitute Specification at page 1 under the "CROSS-REFERENCE" heading to set forth a statement which identifies the parent application of this application, and the status of the parent application will be up-dated subsequently.

With regard to the further amendments set forth in the Substitute Specification, but for the amendments at page 8, lines 18 - 21, the amendments correspond in form and substance with the amendments entered and approved in the parent application, and that approval, it is submitted, should be accorded full faith and credit. Further, although discussion of the specification amendments is not required to demonstrate absence of new matter because of the Rule 125 Statement submitted with the Substitute Specification, for completeness of the record, discussion of the amendments set forth in the Substitute Specification is presented below.

In addition to presentation of the new title, cross-reference heading and statement and a fresh "BACKGROUND" heading in the Substitute Specification at page 1, the as-filed

field statement (lns. 10 - 11) is deleted and a new field statement, which presents description which directs attention to the subjects matter areas which relate to the present invention, is set forth. For support, see the description of the art in the Substitute Specification at pages 1 - 4 and see also the disclosure in the Substitute Specification at page 7, lines 15 - 21, and at page 8, lines 25 - 31.

Amendments are presented at pages 3 and 4 of the Substitute Specification to provide more formal identifications of the documents to which reference is made and to place the identifications in a format like that conventionally employed in U.S. practice, and it respectfully is submitted that it will be found apparent readily from the contexts of the disclosure as filed and as amended that the further amendments presented at page 1 through page 4, line 12, are formal in nature and operate to improve readability and hence, form, and that they do not alter the disclosure substantively, and thus, detailed discussion of each such amendment is not believed necessary.

The SUMMARY heading at page 4 of the Substitute Specification is reformatted, and in addition to editorial and other amendments which, it is submitted, will be found from the contexts of the surrounding disclosure as filed and as amended to be formal and non-substantive, as in the parent application, the amendments at page 4, line 20, to page 5, line 7, make express that the crumb product is for preparing chocolate products and include the following matters of a substantive nature.

In view of use of the term "mixture" in the disclosure as filed, as apparent from the Substitute Specification at page 5, lines 3 and 7, it is submitted that it should be found that introduction of the term "mixture" at page 4, line 20, is appropriate. As also will be noted, the amendments characterize the component substances employed in the crumb-making process of the present invention as "ingredients" which, it is submitted, is an apt and appropriate descriptive term for the same. Additionally, these amendments also set forth that

that the ingredients are “added together”, which makes explicit that which is, at the least, implicit in the disclosure, as filed, and such, obviously, also is supported by the Examples.

So, too, as in the parent application, it is submitted that it should be found that use of the term “maintaining” (p. 5, ln. 3) necessarily follows from and is aptly descriptive of the period of heating for reacting the product, and in this regard, see also the disclosure in Example 1 at page 10, lines 27 - 30, and additionally, the page 5, line 5, amendment operates to characterize the product produced by mixing and heating as a “heat-treated” product, a description which necessarily follows from the heating procedure, and such is apparent from the contexts of the disclosure as filed and as amended.

Also as in the parent application, in view of the “SUMMARY” heading/portion of the disclosure, summaries of the concentrated crumb product and of the process of milk chocolate preparation with the crumb products prepared, which applicants regard as part of their invention together with process subject matter for preparing crumb products, are presented in the Substitute Specification at page 5, lines 9 - 20. As will be noted, these summaries find support in the as-filed summary disclosures set forth in the Substitute Specification at page 7, lines 23 - 28, and at page 8, lines 25 - 31, and to avoid redundancy, the text of the cited disclosures at pages 7 and 8 are deleted.

In addition to reformatting the “DETAILED DESCRIPTION” heading at page 5 of the Substitute Specification, the amendment at page 5, line 26, is presented to improve readability and format.

Additionally, it respectfully is submitted that, but for the amendments set forth in the Substitute Specification at page 8, lines 18 - 21, and arguably, the amendment set forth at page 10, line 1, the Examiner will find it apparent readily that the further amendments set

forth from page 6, line 19, *et seq.*, which include, principally, editorial and spelling changes, operate to improve readability and format and hence, form, and do not alter the disclosure substantively, and thus, detailed discussion of each such amendment again is not believed necessary.

As for the page 8 amendment noted above, the “without vacuum conditions” insertion makes express that which is, at the least, implicit from the surrounding disclosure, and further, note that the Examples are carried out without application of vacuum conditions (i.e., use of a fan during drying).

As for the page 10, line 1, amendment, it is submitted that the Examiner will find from the context of the preceding disclosure of the matters described at page 9 that the term “observations” is a better characterization/description of those matters than was provided by the term “data” and that such thus also places the disclosure in better form.

Based upon the foregoing, it respectfully is submitted that it should be found that the Substitute Specification amendments do not introduce new matter, and entry and approval of the Substitute Specification respectfully are solicited.

Additionally, based upon the foregoing, it respectfully is submitted that it should be found that the disclosure of the separate page abstract also does not introduce new matter, and therefore, entry and approval of the same respectfully are solicited, too.

Further since the various terminology discussed above is employed in the claims presented by this amendment, see also MPEP §608.01(o) (conforming specification and claim terminology).

Support for independent process claim 20 and dependent process claims 21/20 and 22/20 is found in the Substitute Specification, for example, at page 4, line 20, to page 5, line 7, and at page 8, lines 18 - 23, and see also the description at page 6, lines 19 - 23, and Example 1 at pages 10 - 11, and see again the discussion above of the amendments to the cited portions of the specification.

Support for the limitations of dependent process claim 23 is found in the Substitute Specification, for example, at page 10, lines 18 - 20.

Support for the limitations of dependent claims 24 - 28 is found in the Substitute Specification, for example, at page 6, line 29, to page 7, line 13.

Support for the limitations of dependent process claim 29 is found in the Substitute Specification, for example, at page 6, lines 23 - 27 (as amended), and at page 7, lines 23 - 28 (as filed).

Support for the limitation of dependent process claim 30 is found in the Substitute Specification, for example, at page 8, lines 1 - 3.

Support for the limitations of dependent process claims 31 and 32 is found in the Substitute Specification, for example, at page 8, lines 16 - 23.

Support for the limitations of dependent process claims 33 - 37 is found in the Substitute Specification, for example, at page 5, line 26, to page 6, line 13.

Based upon the foregoing, it respectfully is submitted that it should be found that the claims presented above do not introduce new matter, and entry and consideration on the merits of the same respectfully are solicited.

To advance prosecution to an early favorable conclusion, note is made that process claims in the parent application of this application were rejected under 35 U.S.C. §103(a) as being unpatentable over Siukola, et al., U.S. Patent No. 5, 962, 063 (Siukola) "in light of" Desrosier, ELEMENTS OF FOOD TECHNOLOGY, Avi Publishing Company, Westport, CT 1977, and further note is made that, in the Paper No. 22 final action in the parent application (copy appended under divider Tab 1), the Examiner acknowledged that Desrosier did not fill a moisture content gap. However, in an attempt to fill the moisture content gap, the Examiner advanced rationale comprised of interpretations of Siukola.

As set forth in the parent application final action at page 2, the Examiner directed attention to Siukola disclosure at column 3, lines 28 - 30, stating that this disclosure shows "the concept of maintaining the product in the driest form possible", and based upon that, the Examiner concluded that "to reduce or minimize the water or moisture content in the Siukola process would have been an obvious way to prepare the ... product of Siukola". However, what the cited portion of Siukola discloses and teaches is that, because of the desired sweeteners employed in that invention, control of temperature is important, and that is exemplified, in particular, by Siukola Reference Example A ("the temperature of the mass was higher than the melting point of the seed crystals") (col. 5, lns. 35 - 37) and by other Examples. Moreover, Siukola teaches that his process "employs conventional crumb-manufacturing methods and conditions but for control of the temperature" (col. 4, lns. 26 - 28), the temperature being controlled so that melting of the sweetener is avoided (see also col. 3, lns. 16 - 42).

In sum, the Examiner's "concept" foundation, with all due respect, does not find factual evidentiary basis in Siukola, and the Examiner's ultimate moisture content conclusion does not find foundation or factual support in Siukola. To the contrary of the Examiner's rationale advanced in the noted parent application final action, it is submitted that it must be found that the cited Siukola disclosure provides no information whatsoever which would give rise even to contemplation of "reducing" or "minimizing" the water content of the initial Siukola work-piece ingredient mix.

Further, it is not seen that any art in the parent application (supplied also in this application by an Information Disclosure Statement) provides any basis whatsoever which can lead to a conclusion that the person of ordinary skill would have been led to or otherwise arrive at combinations of limitations which, as claimed above, include a drying step without vacuum conditions -- a difference and departure from the art which, it is submitted, in and of itself mandates that all claims should be found to be patentable.

In view of the foregoing, favorable action on the merits, including entry and approval of the Substitute Specification, the separate page abstract and entry allowance of all claims presented above, respectfully is solicited.

Respectfully Submitted,

VOGT & O'DONNELL, LLP
Attorneys of Record

By: 

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Euan ARMSTRONG, *et al.*
Serial No. : 09/ _____ (Rule 53(b)(1) continuation of 09/260,855)
Filed : Concurrently herewith
For : **CHOCOLATE CRUMB**
Group Art Unit : 1761 (Anticipated)
Examiner : Carolyn Paden (Anticipated)

SUBMISSION OF SEPARATE PAGE ABSTRACT

March 30, 2001

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Appended herewith is an abstract presented on a separate page. (See the PRELIMINARY AMENDMENT TOGETHER WITH SUBMISSION OF SUBSTITUTE SPECIFICATION INCLUDING RULE 125 STATEMENT submitted concurrently herewith at pages 2, 6, 7 and 10).

Respectfully Submitted,

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-- ABSTRACT OF THE DISCLOSURE

Crumb products for preparing chocolate products are prepared by adding together , mixing and heating ingredients which include milk solids and a sugar ingredient, particularly sucrose, and which include, optionally, cocoa solids and so that the ingredients added together, mixed and heated have a moisture content between 1.2% and 8%. The ingredients added together are mixed and heated so that the ingredients being mixed are heated-up to a temperature in a range of from 85°C to 180°C and so that upon being heated-up to a temperature in the range which is a temperature of at least 85°C and up to 180°C, the ingredients being mixed are maintained at a temperature in a range of from 85°C to the heated-up temperature for a period of from 2.5 minutes to 25 minutes to provide a heat-treated reaction product, and then the reaction product is dried at a temperature of from 60°C to 80°C, which may be performed without vacuum conditions. --.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Euan ARMSTRONG, *et al.*
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SUBSTITUTE SPECIFICATION RULE 125 STATEMENT

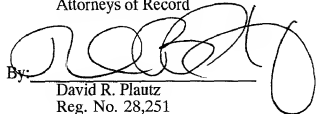
March ~~30~~, 2001

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir :

In accordance with 37 CFR 1.125 and MPEP §§608.01(q) and 714.20, the "MARKED-UP" and "CLEAN" versions of the Substitute Specification submitted herewith contain the same changes, and it is submitted that it should be found that the Substitute Specification does not contain new matter.

Respectfully Submitted,
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SUBSTITUTE SPECIFICATION

"MARKED-UP" VERSION

U.S.S.N. 09/____ (Rule 53(b)(1) continuation of 09/260,855)

5 [CHOCOLATE CRUMB]

[FIELD OF THE INVENTION]

10 [The present invention relates to a chocolate crumb, to a method for its preparation, and to milk chocolate prepared from the chocolate crumb.]

[BACKGROUND OF THE INVENTION]

15 **PREPARATION OF CRUMB PRODUCTS FOR CHOCOLATE**

PRODUCTION

CROSS-REFERENCE TO RELATED APPLICATION

20 This is a continuation application of Application Serial No. 09/260,855 which was filed March 1, 1999.

BACKGROUND OF THE INVENTION

25 The present invention relates to processes and ingredient formulations for preparing crumb products, particularly chocolate crumb products, which include milk solids and sweetener, for preparing chocolate products and to preparation of chocolate products with the crumb products.

30 Milk chocolate differs from dark or plain chocolate in that it contains milk solids and the essential part of a process for preparing [the] milk chocolate [process] is the method used to incorporate the milk solids. Milk chocolate is virtually moisture-

free in that it [and] contains from 0.5-1.5% water, while full cream milk contains about 87.5% water, the remainder being about 12.5% milk solids including fat, [fat, the remainder being about 87.5% water.]

5 One method of removing the 87.5% water from [the] milk is by evaporation of the liquid milk and drying to a powder, and a traditional method of producing milk chocolate is by mixing the milk powder together with cocoa liquor or cocoa nibs, sugar, and cocoa butter, followed by refining, conching and tempering.

10 Another method which results in [of] removing the 87.5% water from [the] milk is by condensing and drying a mixture comprising either liquid milk or milk concentrate together with sugar and cocoa liquor under vacuum and at elevated temperatures to produce a chocolate crumb powder. This process for making chocolate crumb was originally intended to preserve milk solids in a stable form over
15 long periods of time, and the chocolate crumb is used as an intermediary product in another traditional method of production of milk chocolate which comprises mixing chocolate crumb with cocoa butter, followed by refining, conching and tempering.

20 One advantage of chocolate crumb powder is that it has excellent storage properties and prevents rancidity of the fats in the milk. This enables the chocolate crumb to be manufactured well in advance of the manufacture of the milk chocolate, and the crumb can [easily] be transported easily to any desired destination. In addition, the use of chocolate crumb instead of milk powder provides a rich, creamy partially caramelised flavor [flavour] which has proved extremely desirable to a large
25 number of consumers. Although milk is sometimes transported to chocolate factories where the crumb is produced, since milk soon turns sour, it is preferable to install the crumb factories in dairy farming rural regions where there is a steady supply of fresh liquid milk. Often the crumb factories are in chocolate factories in dairy regions.

It would be convenient to manufacture crumb-type chocolates in regions where it has not previously been feasible and attempts have been made to imitate the flavor [flavour] produced by the crumb process using standard milk powders. However, none of these methods has yet produced an adequate substitute.

For example, Great Britain Complete Patent Specification No. 1 425 839 describes [GB-B-1425839 claims] a method for [of] manufacturing a milk chocolate, wherein the process steps comprise [comprising the steps of] melting sugar by heating it to a temperature of between 188° and 210°C, mixing the heated, molten sugar with milk powder, and processing the mixture with other chocolate - making ingredients to form a milk chocolate. However, molten sugar is difficult to handle and requires a high energy input, and amorphous sugar may be formed together with a high viscosity which could influence the texture and lead to non-desirable flavors [flavours] at the high temperature used.

U. S. Pat. No. 3, 622, 342 [USP3622342] describes a method for preparing chocolate crumb from milk solids by dry blending the milk solids with sugar and cocoa liquor and then extrusion - cooking the mixture in the presence of a little water at a temperature from about 104° to 127°C for a period of from about 1-3 seconds followed by cooling and comminuting. The chocolate crumb may be used to produce milk chocolate by conventional methods. However, the capital cost of the extruder is very high, and the process reaction time is very short, which may inherently limit the range of flavors. [flavours.]

Great Britain Complete Patent Specification No. 1 537 377 [GB-A-1,537,377] describes a method for [of] making a milk chocolate in which a mixture based on milk and sugar is prepared and then dried under reduced pressure to form a product of the crumb type which is compressed under a pressure of at least 100 kg/cm² [100 kg/cm²] and subsequently processed into milk chocolate. However, the process

is only concerned with the production of white crumb, and the vacuum/evaporation process is carried out at a temperature of only about 80°C, and at such a low temperature there will be little or no caramelisation and a restricted flavor. [flavour.]

- 5 German Patent Application Publication No. DE 35 02 446 [DE3502446] describes a method for the preparation of chocolate crumb which comprises mixing milk powder and icing sugar and water at about 80°C and then adding cocoa paste and heating [heat] to about 100° to 110°C in a slowly revolving mixer (the water and heat being introduced in the form of steam through nozzles), followed by drying.
- 10 However, the use of icing sugar is more expensive than ordinary sugar and gives a different texture. In addition, icing sugar causes the formation of large lumps which can increase the viscosity and cause blockages. Further, this document [DE3502446] gives no indication of the reaction time nor the quantities of ingredients used, except the water.

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[SUMMARY OF THE INVENTION]

SUMMARY OF THE INVENTION

- 20 We have found that by reacting a mixture of ingredients which comprise milk solids[,] and a sugar, and optionally cocoa solids, and which has a water content of [liquor and] from 1.2 to 8% [total water content] in a mixer at a temperature of 85° to 180°C for a period of from 2.5 to 25 minutes followed by drying to a moisture content of less than 3%, not only is an excellent [chocolate] crumb obtained for the preparation
- 25 of chocolate products, but the flavor also [the flavour] can be tailored to requirements by adjusting the temperature, time and water content.

- Accordingly, the present invention provides a process for the preparation of
- 30 [chocolate] crumb products for preparing chocolate products which comprises adding together and mixing and heating ingredients which comprise milk solids[,]

and a sugar, in the absence or presence of cocoa solids, and wherein the ingredients have a water content of [and] from 1.2 to 8% by weight [of water] based on the weight of the mixture, in a mixer to a temperature of 85° to 120°C, maintaining the mixture [reacting] at a temperature of 85° to 180°C for a period of from 2.5 to 25 minutes to obtain a heat-treated reaction product and then drying the reaction product [followed by drying] to a moisture content of less than 3% by weight based on the total weight of the product. [mixture.]

The present invention also provides a concentrated crumb product comprising low-fat milk solids and sugar, and optionally cocoa solids, wherein the ratio of milk solids to sugar is between 1:1.5 and 1:0.1. When cocoa solids are present, the amount of cocoa solids in the concentrated chocolate crumb preferably is from 10 to 15% by weight based on the total weight of the mixture.

The present invention also provides a method for making a milk chocolate product which comprises mixing a crumb product prepared by the crumb-making process of the present invention with further ingredients (cocoa liquor, cocoa butter and butter oil) employed for making milk chocolate products and processing the ingredients to prepare a milk chocolate product such as wherein the mixture is refined by means of refining rollers, conched and then tempered.

[DETAILED DESCRIPTION OF THE INVENTION]

DETAILED DESCRIPTION OF THE INVENTION

For practice of the crumb-making process of the present invention, the [The] milk solids may comprise, for example, whole milk powder, whey proteins or low fat milk solids. The low fat milk solids preferably contain less than 5% by weight of

fats, more preferably less than 2% by weight of fats and are [is] most preferably skimmed milk powder, or ingredients thereof or recombined dairy solids. The amount of milk solids may be from 20 to 70% and preferably from 25 to 65% by weight based on the total weight of the mixture.

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The sugar used is preferably in the form of a dry powder which may be crystalline or in the form of a slurry. The sugar used may be, for example, sucrose, glucose, dextrose, lactose, fructose, invert sugar, corn syrup solids or sugar replacers such as polyols, e.g. sorbitol, mannitol, xylitol, maltitol[,] , lactitol, polydextrose, etc., or mixtures thereof. Preferably, the sugar used is sucrose alone but, if desired, one or more other sugars may be used together with sucrose in an amount up to 25% by weight based on the total weight of the sugar, e.g. from 5 to 20% by weight based on the total weight of the sugar. If desired, a part of the sugar or sugar replacer may be replaced by a low calorie sweetening agent such as a cyclamate, aspartame or nutrasweet. The amount of sugar used may be from 10 to 75% and preferably from 20 to 70% by weight based on the total weight of the mixture.

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In conventional processes for [of] producing [chocolate] crumb for preparing chocolate products, the ratio of milk solids to sugar is conventionally from about 1:3 to 1:1.5 and [such ratios may be used in the present invention,] more usually from 1:2.5 to 1:1.75, and such ratios may be used for preparing the crumb products of the present invention. However, in the process of the present invention, it is possible to produce a concentrated chocolate crumb by reducing the amount of sugar used in order to improve the processing and increase the production capacity. In this case, the ratio of milk solids to sugar may be between 1:1.5 and 1:0.1, preferably from 1:1.25 to 1:0.3 and especially from 1:1 to 1:0.75.

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When the process is carried out in the absence of cocoa solids, a white crumb is obtained. When the process is carried out in the presence of cocoa solids, the cocoa

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solids may be in the form of cocoa liquor, cocoa powder or cocoa butter alternatives which are vegetable fats such as cocoa butter equivalents (CBE) or cocoa butter substitutes (CBS) which are well known to those skilled in the art, e.g., CBS laurics and CBS nonlaurics (see Minifie, Chocolate, Cocoa, and Confectionery; Third Edition, Chapman and Hall, New York, 1989, [Bernard W. Minifie; AVI], pp. 100-109). The cocoa liquor may be conventional cocoa liquor produced by roasting cocoa beans, cooling, winnowing to form [the] nibs and grinding the nibs to form a [the] liquor containing from about 50 to 60% cocoa butter. The cocoa powder may be obtained by extracting the cocoa butter from the cocoa liquor by conventional methods.

The amount of cocoa solids used in the process of the present invention may be from 3 to 20% by weight based on the total weight of the mixture. The amount of cocoa solids generally used in the concentrated chocolate crumb of the present invention may be from 5 to 15% by weight based on the total weight of the mixture.

It should be understood that the expression "chocolate crumb" used in this invention is intended to include crumb which may be used for making a compound coating or a substitute chocolate wherein [where] some or all of the cocoa solids are replaced by cocoa butter alternatives, or which contain sugar replacers or ingredients such as carob or soya protein isolates. Compound coatings are well known to those skilled in the art (see again Minifie at pp. 165 - 182). [Chocolate, Cocoa, and Confectionery; Third Edition, 1989, Bernard W. Minifie; AVI, pp 165-182].]

[The present invention also provides a concentrated chocolate crumb comprising low fat milk solids, sugar and optionally cocoa solids wherein the ratio of milk solids to sugar is between 1:1.5 an 1:0.1, preferably between 1:1.25 and 1:0.3. When cocoa solids are present, preferably the amount of cocoa solids in the concentrated chocolate crumb is from 10 to 15% by weight based on the total weight of the mixture.]

The amount of water used in the process of the present invention is preferably from 1.5 to 7.5% and more preferably from 1.75 to 6.5% by weight based on the total weight of the mixture.

5 The mixer may be a low- or high- shear mixer, e.g. a Lödige high- shear mixer (Batch mixer FKM 600D- Morton Machines Ltd.) having three ploughs fitted on the main shaft and two high-speed chopper blades. The speed of a low- shear mixer is usually from 50 to 100 rpm while that of a high- shear mixer is usually from 1000 to 3000 rpm. Speeds between 100 and 1000 rpm are also suitable in the process of this invention.

10 The mixing of the ingredients preferably provides a homogeneous mass, and the time required to raise the temperature to from 85° to 120°C may be from 30 to 150 minutes, preferably from 60 to 120 minutes. The reaction time of the mixture at from 15 85° to 180°C is preferably from 5 to 20 minutes. The reaction temperature is preferably from 90° to 120°C. After the reaction, the drying temperature may be from 60° to 80°C and preferably from 65° to 75°C. The duration of the drying may be from 30 to 150 minutes and preferably from 60 to 120 minutes. The drying may [, if desired,] be carried out without or with vacuum conditions, [under vacuum,] and if a vacuum process is used, the drying time is advantageously from 30 to 60 minutes. 20 During drying, without or with vacuum conditions, the moisture content is preferably reduced to below 2% and more preferably to below 1% by weight based on the total weight of the mixture.

25 [The present invention also provides a method of making a milk chocolate which comprises mixing a chocolate crumb prepared by a process of the present invention with the remainder of the chocolate ingredients (cocoa liquor, cocoa butter and butter oil) and processing into milk chocolate. The chocolate crumb may be mixed with the remainder of the chocolate ingredients, conveniently in the same mixer 30 as used for making the crumb, and the mixture may then be refined by means of refining rollers, conched and then tempered.]

5 The flavor [flavour] of [the] milk chocolate prepared by the processes of the present invention can be varied according to desired requirements [as desired] by varying the reaction time, the reaction temperature and the water content during the reaction. Generally, the longer the reaction time, the higher the reaction temperature and the greater the water content, the more intense and complex are the flavors [flavours] obtained.

10 For example, using a crumb containing a conventional ratio of milk solids to sugar of from 1:3 to 1:1.5, changes in processing conditions result in flavor differences between [the following flavour changes of the] milk chocolate products prepared from the crumb as follows: [are obtained:]

- 15 a) Increase of the reaction time between 5 and 25 minutes gives an increase of stale flavor. [flavour.]
- b) Increase of the reaction temperature gives an increase of cocoa and milk smell, and increase of caramel and fruity flavors [flavour] and a decrease of astringency and malt flavor. [flavour.]
- c) Increase of the initial water content gives a decrease of cocoa flavor [flavour] and an increase in caramel and butter flavors. [flavour.]

20 On the other hand, using a concentrated crumb containing a ratio of milk solids to sugar between 1:1.5 and 1:0.1, changes in processing conditions result in flavor differences between [the following flavour changes of the] milk chocolate products prepared from the crumb as follows: [are obtained:]

- 25 a) Increase of the reaction time between 5 and 25 minutes gives a decrease in milk flavor [flavour] and an increase in cocoa and malt flavors. [flavour.]
- b) Increase of the reaction temperature gives an increase of stale flavor. [flavour,] sweetness, and bitterness and an increase of caramel flavor. [flavour.]
- 30 c) Increase of the initial water content gives an increase of nutty flavor. [flavour.]

To summarise the above observations [data] generally, for all the crumbs prepared according to the process of the present invention, the longer the reaction time, the higher the reaction temperature and the greater the specific range of the water content of the initial mix, the more intense and complex are the flavors [flavours] obtained in [the] milk chocolates prepared [produced] from them. The milk chocolates prepared from a concentrated crumb are more astringent and creamier than the milk chocolates prepared from a crumb containing a conventional ratio of milk solids to sugar of from 1:3 to 1:1.5.

[EXAMPLES]

EXAMPLES

The following Examples further illustrate the present invention.

Example 1

40.95 kg [40.95kg] of skimmed milk powder, 97.35 kg [97.35kg] of sucrose and 11.7 kg [11.7kg] cocoa liquor together with 3 kg [3kg] (2%) water are fed in to the top of a Lödige high-shear mixer (Batch mixer FKM 600D) which is fitted with a water jacket and which has a [jacket,] thermostatic probe, a fan, three ploughs fitted to the main shaft running along the main mixer body wherein the distance between the surface of the ploughs and the mixer inner surface is from 5 - 10 mm [5-10mm,] two high-speed chopper blades, and an aspiration facility enabling rapid removal of moisture from the mix. (To a total moisture content of around 3.5%)

The ingredients are mixed and heated to 90°C over a period of 90 minutes, reacted at 90°C for 15 minutes using the high-shear chopper blades and then dried at 70°C for 90 minutes with the fan turned on to reduce the moisture content to below 1% resulting in a crumb containing 64.9% sucrose, 27.3% milk solids and 7.8% cocoa

liquor. Milk chocolate is prepared by adding to this crumb (70.55%), cocoa liquor (9.22%), cocoa butter (13.69%), butter oil (6.54%), and vanillin crystals (0.04%), mixing for 5 minutes to form a homogeneous mass, passing through 2-roll and 5-roll refiners to give an average particle size of from 20-40 mm. [micrometres.] followed by conching with the addition of 1.2% of a mix of lecithin and cocoa butter, tempering and molding [moulding] by conventional methods. The milk chocolate produced has a caramel, milky, sweet crumb flavor. [flavour.]

Example 2

The procedure of Example 1 is repeated except that 6 kg [6kg] (4%) water is added instead of 3 kg [3kg] there used. The milk chocolate produced has a stronger caramel, biscuit crumb flavor. [flavour.]

Example 3

A concentrated crumb is produced having a milk solids to sugar ratio of about 1:0.9 by a similar process to that described in Example 1 but using 67.07 kg [67.07kg] of skimmed milk powder, 63.78 kg [63.78kg] of sucrose and 19.16 kg [19.16kg] cocoa liquor together with 3 kg [3kg] (2%) water. (To a total moisture content of around 7%)

The ingredients are mixed and heated to 90°C over a period of 90 minutes, reacted at 90°C for 15 minutes using the high-shear chopper blades and then dried at 70°C for 90 minutes with the fan turned on to reduce the moisture content to below 1% resulting in a crumb containing 42.52% sucrose, 44.71% milk solids and 12.77% cocoa liquor. Milk chocolate is prepared by adding to this crumb (43.08%), sugar (27.47%), cocoa liquor (9.22%), cocoa butter (13.69%), butter oil (6.54%), and vanillin crystals (0.04%), mixing for 5 minutes to form a homogeneous mass, passing through 2-roll and 5-roll refiners to give an average particle size of from 20-40

mm, [micrometres,] followed by conching with the addition of 1.2% of a mix of lecithin and cocoa butter, tempering and molding [moulding] by conventional methods. The milk chocolate produced has a caramel crumb flavor [flavour] which is more astringent and creamier than that of Example 1.

Example 4

A concentrated crumb is produced having a milk solids to sugar ratio of about 1:0.33 by a similar process to that described in Example 1 but using 98.14 kg [98.14kg] of skimmed milk powder, 32.71 kg [32.71kg] of sucrose and 19.15 kg [19.15kg] cocoa liquor together with 9 kg [9kg] (6%) water. The ingredients are mixed and heated to 90°C over a period of 90 minutes, reacted at 90°C for 15 minutes using the high-shear chopper blades and then dried at 70°C for 90 minutes with the fan turned on to reduce the moisture content to below 1% resulting in a crumb containing 42.52% sucrose, 44.71% milk solids and 12.77% cocoa liquor. Milk chocolate is prepared by adding to this crumb the other ingredients of chocolate in a similar procedure to that described in Example 3. The milk chocolate produced has a caramel crumb flavor [flavour] which is more astringent and creamier than that of Example 1.

SUBSTITUTE SPECIFICATION

"CLEAN" VERSION

5 U.S.S.N. 09/_____ (Rule 53(b)(1) continuation of 09/260,855)

PREPARATION OF CRUMB PRODUCTS FOR CHOCOLATE PRODUCTION

10

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation application of Application Serial No. 09/260,855 which was filed March 1, 1999.

15

BACKGROUND OF THE INVENTION

The present invention relates to processes and ingredient formulations for preparing crumb products, particularly chocolate crumb products, which include milk solids and sweetener, for preparing chocolate products and to preparation of chocolate products with the crumb products.

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Milk chocolate differs from dark or plain chocolate in that it contains milk solids and the essential part of a process for preparing milk chocolate is the method used to incorporate the milk solids. Milk chocolate is virtually moisture-free in that it contains from 0.5-1.5% water, while full cream milk contains about 87.5% water, the remainder being about 12.5% milk solids including fat.

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One method of removing the 87.5% water from milk is by evaporation of the liquid milk and drying to a powder, and a traditional method of producing milk chocolate is by mixing the milk powder together with cocoa liquor or cocoa nibs, sugar, and cocoa butter, followed by refining, conching and tempering.

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Another method which results in removing the 87.5% water from milk is by condensing and drying a mixture comprising either liquid milk or milk concentrate together with sugar and cocoa liquor under vacuum and at elevated temperatures to produce a chocolate crumb powder. This process for making chocolate crumb was originally intended to preserve milk solids in a stable form over long periods of time, and the chocolate crumb is used as an intermediary product in another traditional method of production of milk chocolate which comprises mixing chocolate crumb with cocoa butter, followed by refining, conching and tempering.

One advantage of chocolate crumb powder is that it has excellent storage properties and prevents rancidity of the fats in the milk. This enables the chocolate crumb to be manufactured well in advance of the manufacture of the milk chocolate, and the crumb can be transported easily to any desired destination. In addition, the use of chocolate crumb instead of milk powder provides a rich, creamy partially caramelised flavor which has proved extremely desirable to a large number of consumers. Although milk is sometimes transported to chocolate factories where the crumb is produced, since milk soon turns sour, it is preferable to install the crumb factories in dairy farming rural regions where there is a steady supply of fresh liquid milk. Often the crumb factories are in chocolate factories in dairy regions.

It would be convenient to manufacture crumb-type chocolates in regions where it has not previously been feasible and attempts have been made to imitate the flavor produced by the crumb process using standard milk powders. However, none of these methods has yet produced an adequate substitute.

For example, Great Britain Complete Patent Specification No. 1 425 839 describes a method for manufacturing a milk chocolate, wherein the process steps comprise melting sugar by heating it to a temperature of between 188° and 210°C, mixing the heated, molten sugar with milk powder, and processing the mixture with other chocolate - making ingredients to form a milk chocolate. However, molten

sugar is difficult to handle and requires a high energy input, and amorphous sugar may be formed together with a high viscosity which could influence the texture and lead to non-desirable flavors at the high temperature used.

5 U. S. Pat. No. 3, 622, 342 describes a method for preparing chocolate crumb from milk solids by dry blending the milk solids with sugar and cocoa liquor and then extrusion - cooking the mixture in the presence of a little water at a temperature from about 104° to 127°C for a period of from about 1-3 seconds followed by cooling and comminuting. The chocolate crumb may be used to produce milk chocolate by
10 conventional methods. However, the capital cost of the extruder is very high, and the process reaction time is very short, which may inherently limit the range of flavors.

Great Britain Complete Patent Specification No. 1 537 377 describes a method for making a milk chocolate in which a mixture based on milk and sugar is
15 prepared and then dried under reduced pressure to form a product of the crumb type which is compressed under a pressure of at least 100 kg/cm² and subsequently processed into milk chocolate. However, the process is only concerned with the production of white crumb, and the vacuum/evaporation process is carried out at a temperature of only about 80°C, and at such a low temperature there will be little or no
20 caramelisation and a restricted flavor.

German Patent Application Publication No. DE 35 02 446 describes a method for the preparation of chocolate crumb which comprises mixing milk powder and icing
25 sugar and water at about 80°C and then adding cocoa paste and heating to about 100° to 110°C in a slowly revolving mixer (the water and heat being introduced in the form of steam through nozzles), followed by drying. However, the use of icing sugar is more expensive than ordinary sugar and gives a different texture. In addition, icing sugar causes the formation of large lumps which can increase the viscosity and cause blockages. Further, this document gives no indication of the reaction time nor the
30 quantities of ingredients used, except the water.

SUMMARY OF THE INVENTION

We have found that by reacting a mixture of ingredients which comprise milk solids and a sugar, and optionally cocoa solids, and which has a water content of from 1.2 to 8% in a mixer at a temperature of 85° to 180°C for a period of from 2.5 to 25 minutes followed by drying to a moisture content of less than 3%, not only is an excellent crumb obtained for the preparation of chocolate products, but the flavor also can be tailored to requirements by adjusting the temperature, time and water content.

Accordingly, the present invention provides a process for the preparation of crumb products for preparing chocolate products which comprises adding together and mixing and heating ingredients which comprise milk solids and a sugar, in the absence or presence of cocoa solids, and wherein the ingredients have a water content of from 1.2 to 8% by weight based on the weight of the mixture, in a mixer to a temperature of 85° to 120°C, maintaining the mixture at a temperature of 85° to 180°C for a period of from 2.5 to 25 minutes to obtain a heat-treated reaction product and then drying the reaction product to a moisture content of less than 3% by weight based on the total weight of the product.

The present invention also provides a concentrated crumb product comprising low-fat milk solids and sugar, and optionally cocoa solids, wherein the ratio of milk solids to sugar is between 1:1.5 and 1:0.1. When cocoa solids are present, the amount of cocoa solids in the concentrated chocolate crumb preferably is from 10 to 15% by weight based on the total weight of the mixture.

The present invention also provides a method for making a milk chocolate product which comprises mixing a crumb product prepared by the crumb-making process of the present invention with further ingredients (cocoa liquor, cocoa butter and butter oil) employed for making milk chocolate products and processing the ingredients to prepare a milk chocolate product such as wherein the mixture is refined by means of refining rollers, conched and then tempered.

DETAILED DESCRIPTION OF THE INVENTION

For practice of the crumb-making process of the present invention, the milk solids may comprise, for example, whole milk powder, whey proteins or low fat milk solids. The low fat milk solids preferably contain less than 5% by weight of fats, more preferably less than 2% by weight of fats and are most preferably skimmed milk powder, or ingredients thereof or recombined dairy solids. The amount of milk solids may be from 20 to 70% and preferably from 25 to 65% by weight based on the total weight of the mixture.

The sugar used is preferably in the form of a dry powder which may be crystalline or in the form of a slurry. The sugar used may be, for example, sucrose, glucose, dextrose, lactose, fructose, invert sugar, corn syrup solids or sugar replacers such as polyols, e.g. sorbitol, mannitol, xylitol, maltitol, lactitol, polydextrose, etc., or mixtures thereof. Preferably, the sugar used is sucrose alone but, if desired, one or more other sugars may be used together with sucrose in an amount up to 25% by weight based on the total weight of the sugar, e.g. from 5 to 20% by weight based on the total weight of the sugar. If desired, a part of the sugar or sugar replacer may be replaced by a low calorie sweetening agent such as a cyclamate, aspartame or nutrasweet. The amount of sugar used may be from 10 to 75% and preferably from 20 to 70% by weight based on the total weight of the mixture.

In conventional processes for producing crumb for preparing chocolate products, the ratio of milk solids to sugar is conventionally from about 1:3 to 1:1.5 and more usually from 1:2.5 to 1:1.75, and such ratios may be used for preparing the crumb products of the present invention. However, in the process of the present invention, it is possible to produce a concentrated chocolate crumb by reducing the amount of sugar used in order to improve the processing and increase the production capacity. In this case, the ratio of milk solids to sugar may be between 1:1.5 and 1:0.1, preferably from 1:1.25 to 1:0.3 and especially from 1:1 to 1:0.75.

When the process is carried out in the absence of cocoa solids, a white crumb is obtained. When the process is carried out in the presence of cocoa solids, the cocoa solids may be in the form of cocoa liquor, cocoa powder or cocoa butter alternatives which are vegetable fats such as cocoa butter equivalents (CBE) or cocoa butter substitutes (CBS) which are well known to those skilled in the art, e.g., CBS laurics and CBS nonlaurics (see Minifie, Chocolate, Cocoa, and Confectionery; Third Edition, Chapman and Hall, New York, 1989, [Bernard W. Minifie; AVI], pp. 100-109). The cocoa liquor may be conventional cocoa liquor produced by roasting cocoa beans, cooling, winnowing to form nibs and grinding the nibs to form a liquor containing from about 50 to 60% cocoa butter. The cocoa powder may be obtained by extracting the cocoa butter from the cocoa liquor by conventional methods. The amount of cocoa solids used in the process of the present invention may be from 3 to 20% by weight based on the total weight of the mixture. The amount of cocoa solids generally used in the concentrated chocolate crumb of the present invention may be from 5 to 15% by weight based on the total weight of the mixture.

It should be understood that the expression "chocolate crumb" used in this invention is intended to include crumb which may be used for making a compound coating or a substitute chocolate wherein some or all of the cocoa solids are replaced by cocoa butter alternatives, or which contain sugar replacers or ingredients such as carob or soya protein isolates. Compound coatings are well known to those skilled in the art (see again Minifie at pp. 165 - 182).

The amount of water used in the process of the present invention is preferably from 1.5 to 7.5% and more preferably from 1.75 to 6.5% by weight based on the total weight of the mixture.

The mixer may be a low- or high - shear mixer, e.g. a Lödige high - shear mixer (Batch mixer FKM 600D- Morton Machines Ltd .) having three ploughs fitted on the main shaft and two high-speed chopper blades. The speed of a low - shear

mixer is usually from 50 to 100 rpm while that of a high - shear mixer is usually from 1000 to 3000 rpm. Speeds between 100 and 1000 rpm are also suitable in the process of this invention.

5 The mixing of the ingredients preferably provides a homogeneous mass, and the time required to raise the temperature to from 85° to 120°C may be from 30 to 150 minutes, preferably from 60 to 120 minutes. The reaction time of the mixture at from 85° to 180°C is preferably from 5 to 20 minutes. The reaction temperature is
10 preferably from 90° to 120°C. After the reaction, the drying temperature may be from 60° to 80°C and preferably from 65° to 75°C. The duration of the drying may be from 30 to 150 minutes and preferably from 60 to 120 minutes. The drying may be carried out without or with vacuum conditions, and if a vacuum process is used, the drying time is advantageously from 30 to 60 minutes. During drying, without or with
15 vacuum conditions, the moisture content is preferably reduced to below 2% and more preferably to below 1% by weight based on the total weight of the mixture.

 The flavor of milk chocolate prepared by the processes of the present invention can be varied according to desired requirements by varying the reaction time,
20 the reaction temperature and the water content during the reaction. Generally, the longer the reaction time, the higher the reaction temperature and the greater the water content, the more intense and complex are the flavors obtained.

 For example, using a crumb containing a conventional ratio of milk solids to
25 sugar of from 1:3 to 1:1.5, changes in processing conditions result in flavor differences between milk chocolate products prepared from the crumb as follows:

 a) Increase of the reaction time between 5 and 25 minutes gives an increase of stale flavor.

30 b) Increase of the reaction temperature gives an increase of cocoa and milk smell, and increase of caramel and fruity flavors and a decrease of astringency and malt flavor.

c) Increase of the initial water content gives a decrease of cocoa flavor and an increase in caramel and butter flavors.

On the other hand, using a concentrated crumb containing a ratio of milk solids to sugar between 1:1.5 and 1:0.1, changes in processing conditions result in flavor differences between milk chocolate products prepared from the crumb as follows:

a) Increase of the reaction time between 5 and 25 minutes gives a decrease in milk flavor and an increase in cocoa and malt flavors.

b) Increase of the reaction temperature gives an increase of stale flavor, sweetness, and bitterness and an increase of caramel flavor.

c) Increase of the initial water content gives an increase of nutty flavor.

To summarise the above observations generally, for all the crumbs prepared according to the process of the present invention, the longer the reaction time, the higher the reaction temperature and the greater the specific range of the water content of the initial mix, the more intense and complex are the flavors obtained in milk chocolates prepared from them. The milk chocolates prepared from a concentrated crumb are more astringent and creamier than the milk chocolates prepared from a crumb containing a conventional ratio of milk solids to sugar of from 1:3 to 1:1.5.

EXAMPLES

The following Examples further illustrate the present invention.

Example 1

40.95 kg of skimmed milk powder, 97.35 kg of sucrose and 11.7 kg cocoa liquor together with 3 kg (2%) water are fed in to the top of a Lödige high-shear mixer (Batch mixer FKM 600D) which is fitted with a water jacket and which has a thermostatic probe, a fan, three ploughs fitted to the main shaft running along the

main mixer body wherein the distance between the surface of the ploughs and the mixer inner surface is from 5 - 10 mm two high-speed chopper blades, and an aspiration facility enabling rapid removal of moisture from the mix. (To a total moisture content of around 3.5%)

5 The ingredients are mixed and heated to 90°C over a period of 90 minutes, reacted at 90°C for 15 minutes using the high-shear chopper blades and then dried at 70°C for 90 minutes with the fan turned on to reduce the moisture content to below 1% resulting in a crumb containing 64.9% sucrose, 27.3% milk solids and 7.8% cocoa liquor. Milk chocolate is prepared by adding to this crumb (70.55%), cocoa liquor (9.22%), cocoa butter (13.69%), butter oil (6.54%), and vanillin crystals (0.04%),
10 mixing for 5 minutes to form a homogeneous mass, passing through 2-roll and 5-roll refiners to give an average particle size of from 20-40 mm, followed by conching with the addition of 1.2% of a mix of lecithin and cocoa butter, tempering and
15 molding by conventional methods. The milk chocolate produced has a caramel, milky, sweet crumb flavor.

Example 2

20 The procedure of Example 1 is repeated except that 6 kg (4%) water is added instead of 3 kg there used. The milk chocolate produced has a stronger caramel, biscuit crumb flavor.

Example 3

25 A concentrated crumb is produced having a milk solids to sugar ratio of about 1:0.9 by a similar process to that described in Example 1 but using 67.07 kg of skimmed milk powder, 63.78 kg of sucrose and 19.16 kg cocoa liquor together with 3 kg (2%) water. (To a total moisture content of around 7%)

The ingredients are mixed and heated to 90°C over a period of 90 minutes, reacted at 90°C for 15 minutes using the high-shear chopper blades and then dried at 70°C for 90 minutes with the fan turned on to reduce the moisture content to below 1% resulting in a crumb containing 42.52% sucrose, 44.71% milk solids and 12.77% cocoa liquor. Milk chocolate is prepared by adding to this crumb (43.08%), sugar (27.47%), cocoa liquor (9.22%), cocoa butter (13.69%), butter oil (6.54%), and vanillin crystals (0.04%), mixing for 5 minutes to form a homogeneous mass, passing through 2-roll and 5-roll refiners to give an average particle size of from 20-40 mm, followed by conching with the addition of 1.2% of a mix of lecithin and cocoa butter, tempering and molding by conventional methods. The milk chocolate produced has a caramel crumb flavor which is more astringent and creamier than that of Example 1.

Example 4

A concentrated crumb is produced having a milk solids to sugar ratio of about 1:0.33 by a similar process to that described in Example 1 but using 98.14 kg of skimmed milk powder, 32.71 kg of sucrose and 19.15 kg cocoa liquor together with 9 kg (6%) water. The ingredients are mixed and heated to 90°C over a period of 90 minutes, reacted at 90°C for 15 minutes using the high-shear chopper blades and then dried at 70°C for 90 minutes with the fan turned on to reduce the moisture content to below 1% resulting in a crumb containing 42.52% sucrose, 44.71% milk solids and 12.77% cocoa liquor. Milk chocolate is prepared by adding to this crumb the other ingredients of chocolate in a similar procedure to that described in Example 3. The milk chocolate produced has a caramel crumb flavor which is more astringent and creamier than that of Example 1.